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USSR Report

ECONOMIC AFFAIRS

(FOUO 13/80)

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ECONOMIC POLICY, ORGANIZATION AND MANAGEMENT

FEDORENKO ELABORATES ON FORTHCOMING ECONOMIC TASKS

Moscow VOPROSY EKONOMIKI in Russian No 6, Jun 80 pp 3-11

[Article by Academician N. Fedorenko: "Tasks for Economic Science"]

[Text] The adoption of a series of very important party and government decrees and resolutions last year has had a great effect both on the country's economic development and on the development of economic science. First we should note the CPSU Central Committee November (1979) Plenum at which L.I. Brezhnev delivered a big speech, and also the CPSU Central Committee decrees "On Further Improving the Economic Mechanism and the Tasks of Party and State Organs" and the CPSU Central Committee and USSR Council of Ministers decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" developed in implementation of the CPSU 24th and 25th congress decisions. These documents orient economic scientists to research on the most important problems of economic science and the practice of building communism.

The achievements of economic science in the development of concrete proposals of state significance on the problems of the country's economic development on the basis of fundamental theoretical research are playing a growing role in the realization of measures envisaged by the party and government. A striking example of this is the proposals on the comprehensive program of scientific and technological progress and its socioeconomic consequences, whose development was started on the initiative of economic scientists. The conclusion that there is a need for such a program was preceded by research to build a foundation for predictions about the development of individual sectors, followed by comprehensive prediction for the national economy and its sectors on a unified methodological base. Then, having researched the paths for the development of the economy and the increasing significance of scientific and technological progress as a most important lever for improving efficiency, economic science concluded that there was a need for the development of such a program and the scientific and methodological bases for compiling it. Or, for example, the proposals to create production and scientific-production associations was also the result of careful study of the present-day status of concentration, specialization and cooperation in production,

taking into account the development of science and technology; and proposals to optimize the development and disposition of production facilities worked out on a collective basis by a number of institutes as the result of theoretical analysis of processes taking place in the economy, the utilization of modern mathematical apparatus and the creation of the theoretical bases for economic modeling. Theoretical research lies at the base of proposals on the effectiveness of capital investments and new technology, pricing, cost accounting and other problems.

Realization of the available achievements of economic science requires improvement in the organization of scientific research along a salient that concentrates the efforts of economists on the chief problems of the country's socioeconomic development. What is most important now is that as the plan for scientific research for the period 1981-1985 is being drawn up, it should include the most urgent theoretical and applied problems.

The basic elements of the concept of long-term development of the Soviet economy were determined by the CPSU 24th and 25th congresses; they received further development in the speech of L.I. Brezhnev at the CPSU Central Committee November (1979) Plenum and in the plenum decisions. The essence of this concept is the intensification of production on the basis of improving the economic mechanism and accelerating scientific and technical progress. Not only the strategic line but also those key problems on whose resolution the efficient development of the economy primarily depends, are defined in the party documents. They include: the energy problem, the reorganization of ferrous metallurgy proceeding from the present-day requirements of machine building, solving the food problem on the basis of the balanced development of the agricultural-industrial complex, and a number of others. The task is to substantiate specifically ways of solving these problems.

One very important condition for the successful long-term development of the economy at the present stage is consistent improvement of the economic mechanism, taken in the broad meaning of the word. This presupposes, first, substantiation of rational and objectively conditioned forms for the socialization of production facilities that reflect the present level of production concentration and division of labor, which in turn requires profound revelation of the law-governed principles and forms of the development of production forces in a developed socialist society. Only on this kind of base can scientific substantiation be imparted to proposals on the organizational structure of management and planning and on forms for the organization of production.

Second, there is the further development of the theory and practice of full cost accounting, including interest for all kinds of limited production resources, expansion of credit relations, and more complete consideration of both social costs and social usefulness in prices. A system of concepts and indicators must be developed that would orient cost accounting activity to the end results achieved.

Third, improvement of the economic mechanism should be more complete than at present, taking into account social aspects and providing conditions for the efficient functioning of the economy. Increased incentives for efficient labor, the liquidation of hidden and open losses, and a more consistent improvement of the principle of distribution according to labor, associated not only with wages but also the realization of labor revenue, are required. Under present conditions the active influence of the distribution and consumption spheres on the development of material production is increasing, and this should be fully reflected in the concept of long-term development.

In order to fulfill the tasks outlined by the CPSU Central Committee and USSR Council of Ministers decree on improving the economic mechanism it is necessary to do a great deal of work to create a package of normative and methodological documents of an interdepartmental and departmental nature, concretizing the new procedure for planning and management. As is known, such normatives constitude a finely tuned instrument for economic management that not only stimulates work at the enterprises but also exerts an active effect on the formation of national economic plans and proportions. In accordance with the list of documents proposed by the USSR Gosplan in August 1979, some of the normatives meeting the new requirements have already been worked out. At the same time, it would be expedient to supplement this list with documents such as, for example, a methodology for developing goal-oriented programs, methodology for the assessment of land withdrawn from agricultural use, a methodology for planning at an enterprise, and so forth. Proposals on this question have been submitted to the USSR Gosplan.

Analysis and resolution of the tasks formulated in the party and government decrees on improving the economic mechanism lead to the conclusion that there is a need to draw up a unified, long-term program for improving the management of the socialist economy. Such a program should be worked out as separate stages in a comprehensive introduction of new planning and management methods in line with the development of production relations and production forces.

The next element in improving the economic mechanism in the concept of the country's long-term socioeconomic development is substantiation of the social goals of economic development and ways of achieving them. The institutes of the department should make a deep study of the appropriate problems. A more profound substantiation is needed for ways of improving living standards and rationalizing consumer demand. Here, problems of satisfying effective consumer demand are paramount. There is a need to strengthen research on the law-governed patterns in change in consumer demand, the circulation of money and pricing for consumer goods and services. Since the problems of rationalizing demand are associated with taking into account its particular features in individual republics and regions, more attention should be given to these features. Research on the problems of distribution should also be reinforced. The sources

for the formation of incomes for the population, the structure of incomes, their distribution among the social groups of the population and by sectors of the national economy and territories of the country should all be investigated from the positions of the requirements of the law of distribution for labor, and there should be a simultaneous resolution of a great number of social tasks (liquidation of low incomes, improving conditions for reproduction of the population, strengthening the labor force, increasing the number of pensioners with jobs, and so forth).

It is necessary to continue work on the concept of rational employment for the population, which is frequently unjustifiably identified with maximum employment. There is the problem of substantiating the level and forms of employment for the various categories of the population (youth, women, pensioners) in the various regions of the country (those with a labor force shortage and those with a surplus). In particular, there should be research on the expediency and economic bases for part-time employment of the population, working at home, and holding down several jobs, that is, the variety of forms for the rational utilization of labor.

The third element in the long-term concept for the development of the economy is determination of concrete directions and methods for the intensification of production on the basis of an acceleration of scientific and technical progress. This part of the work is associated with the compilation of a comprehensive program for scientific and technical progress over a 20-year period, which, in accordance with the CPSU Central Committee and USSR Council of Ministers decree of 12 July 1979, will now be worked on regularly. The work already done on the comprehensive program is making it possible to formulate some of the key positions in this element of the general concept for the long-term development of the Soviet economy. Among them we may distinguish, first, the technological reequipping of the country's production apparatus, which is the chief way of accelreating scientific and technical progress and includes the reorganization of ferrous metallurgy on a qualitatively new basis, including expansion of the product mix and improving the quality of metal, a change in the technology and structure of metal utilization, and, primarily, replacement of metal machining with stamping, casting, and welding; the replacement in all sectors of the national economy of technological processes characterized by extensive use of manual labor, metal and energy, with more economical kinds already used in the USSR and in other industrially developed countries; and the implementation of progressive structural shifts in the production and use of construction materials, primarily by replacing metals with construction plastics, the broader use of light walling materials and one-piece concrete structures instead of precast ferroconcrete, and the mass use of aluminum in construction.

Second, there is the development of the agrarian-industrial complex and effective solution of the food problem, primarily by reorganizing its structure and substantially increasing the role of agricultural-biological factors in the development of agriculture. Within the framework of this element of the concept of long-term development it is necessary to substantiate the possibility of transforming the USSR into a major exporter of agricultural produce, primarily grain.

Third, there is increasing the share of capital investments in the development of the production infrastructure as the most effective way of increasing finished output and reducing losses in industrial and agricultural production. Here, great importance is attached to research on long-term problems in the development of transportation. Fourth and finally, there is the increase in the share of expenditure on development of the sectors in the nonproduction sphere and insuring growth and better utilization of the country's scientific educational potential. Among the other elements of the long-term concept of socioeconomic development we may distinguish problems concerned with the development of power engineering, the disposition of production forces, the development of foreign economic links and so forth.

When summing up the results of the activity in some of the establishments of the Economics Department last year, and clarifying current tasks, it should be noted that scientists at, for example, the USSR Academy of Sciences Institute of Economics have done much work on researching urgent problems of the political economy of socialism. There has been serious development in the important question of the relationship between the research method, the theory and economic practice. When working on theoretical and methodological problems concerning the development of public ownership a study was made of its content as the bases of the economic system of socialism, of the new degree of socialization of the production means, and of the interrelationship between public ownership, the social structure of Soviet society, and the socialist way of life; the role of public ownership in deepened economic integration of the socialist countries was shown.

The institute prepared and presented to the directive and planning organs a number of proposals for a draft for the development of the national economy during the 11th Five-Year Plan, including proposals on labor and wages problems, socialist competition, improving the effectiveness of capital investments, the organizational-structural reserves in growth in the efficiency of public production under the conditions of scientific and technical progress, the development of the agrarian-industrial complex of the country, and improving management in science. Research was done on conditions for reproduction of the population, and a socioeconomic evaluation of labor resources and of the main ways for improving efficiency in the utilization of manpower was carried out.

Scientists at the Central Institute of Economic Mathematics prepared and presented to the USSR Gosplan a series of methodological recommendations for drawing up the national economic plan. This was the first part of "Organizational Forms for Planning and Realization of Comprehensive Goal-Oriented Programs"--a complex of methodological materials, algorithms and program for the multistaged optimization of long-term national economic plans. Methodologies for revealing and optimizing the development and disposition of a number of national economic complexes, including timber, wood processing and sawmill and wood processing complexes, have been drawn up and passed to the USSR Gosplan Main Computer Center. The task now is to set about the compilation of standard methodology for optimizing national economic complexes.

Proposals on improving price levels taking into account the development of cost accounting relationships have been prepared and passed to the USSR State Committee on Prices. In these proposals, recommendations have been made for changing the level of prices so as to stimulate an improvement in product quality (for example, in ferrous metallurgy). The first of a set of economico-mathematical models for socioeconomic problems concerned with differentiation in incomes and consumer demand within the framework of comprehensive prediction of the population's living standard for the period 1981-1985 and in the long term, have been prepared jointly with the AUCCTU computer center and passed on for practical introduction. Research results at the institute have been reflected in a number of monographs, including "Demand, Income, and Consumption" and "Models of Socioeconomic Processes and Social Planning," and also in monographs on improving planning and the management of the national economy.

At the Institute of Socioeconomic Problems, principles have been developed for comprehensive planning of the social welfare infrastructure for large cities and for the regulation of demographic development; new indicators have been proposed, designed for assessing the regional efficiency of production, together with a variation of methodological recommendations for the planning of social development in collectives at production associations, which has been passed on to the USSR State Committee for Labor and Social Problems and the Central Statistical Administration. Scientists at the institute have conducted a number of public opinion polls, including a methodological experiment involving postal polling of the population that makes it possible to select the most economical method for organizing this king of poll. This work was done in our country for the first time and is making it possible to start preparations on setting up a postal public opinion poll service. A number of monographs have been prepared for print at the institute, including "Self-Regulation and Prediction of the Social Behavior of the Individual. Theoretical Problems and Experience in Empirical Research." Much work was done last year by the economic scientists of the USSR Academy of Sciences Siberian Department. Thus, the Institute of Economics and Organization of Industrial Production developed variants for the development of the national economy

of the RSFSR up to 1990, evaluated the dynamics in the development of the economy of a republic from the position of a unified national economic complex, and did important work on the role of Siberia in enhancing the efficiency of public production in the country. Examinations were made of the most important social problems in the development of Siberia, together with questions of the formation of multisector and sector complexes, primarily fuel and energy complexes; ways were marked out for solving problems concerned with the comprehensive development of the natural resources of Siberia when working out and implementing comprehensive regional programs; and proposals were presented on the main salients of technical progress in the corresponding regions. Monographs such as "Siberia in a Unified National Economic Complex," "Methodology and Method in Systematic Study of the Countryside" and others were prepared for press.

The USSR Academy of Sciences Presidium has approved the work of the Urals Scientific Center "The Production Forces of the Urals," in which scientists from the Urals Scientific Center Institute of Economics participated actively. Scientists at this institute have also constructed a mathematical model for predicting labor productivity in industry and prepared and published methodological recommendations for predicting labor productivity in agriculture in the region. Optimized models were developed for the functioning and development of water resources systems in the Urals, with the transfer of industrial water supply to closed circulating cycles.

Last year a great deal of work was also done at our republic institutes. These economics institutes actively researched important questions concerning the theory and practice of socialist extended reproduction under regional economic conditions and studied trends in changes in the main reproduction proportions and development rates, and also the interrelationship between the main indicators for proportionality and the efficiency of public production under conditions of developed socialism.

Economists dealing with international matters also achieved important results last year. The collective of the USSR Academy of Sciences Institute of Economics of the World Socialist System prepared for directive and planning-economic organs, scientific reports analyzing the fulfillment of five-year plans and the essence of changes taking place in the economic mechanisms of the socialist countries and substantiating strategy for solving the fuel and energy problem in the CEMA countries, taking into account the new possibilities for cooperation in the eighties. Here, an examination was also made of ways to improve production specialization and cooperation between the USSR and the other CEMA countries in individual sectors of industrial production. Among the most successful results from work last year, mention should be made of the contribution from the institute in preparing materials and documents for the jubilee 33d CEMA Session, and its participation in drawing up long-term programs and general schemes for production specialization and cooperation between the USSR and the GDR, the USSR and Bulgaria and others. Research results dealing with several aspects of the development of the world socialist system were reflected in a number of monographs.

Significant work was done last year by the scientific collective at the USSR Academy of Sciences Institute of World Economics and International Relations in studying economic, social and political problems in the development of present-day capitalism. Research at the institute on conditions for labor productivity growth during the period 1950-1975 was completed, a comparison was made of the levels of labor productivity in individual sectors of industry in the United States and the other most developed capitalist countries, factors affecting these levels were revealed, and an analysis was made of the process of the credit mechanism formation in world economic links in present-day capitalism, its contradictions, and the direction of credit policy in the capitalist and developing countries. Long-term trends in the development of construction under the effect of scientific and technical progress in the economies of the United States, Japan, the FRG and France were revealed, analyzed and compared, and research was conducted on structural shifts in material production. A number of other interesting pieces of research work were also done.

In the field of studying international relations, an analysis was made at the Institute of World Economics and International Relations of the main stages in the process of the development of detente in international relations, its main directions and consequences for the countries of Asia, Africa and Latin America, the interaction between detente and isolated international conflicts, and prospects for its further development; methodology was developed for research, analysis and prediction of the development of international relations and the processes involved in the formation of foreign policy in the capitalist countries. In the field of research on the theoretical and political aspects of problems concerning the transition from capitalism to socialism and problems of proletarian internationalism, the collective of this institute completed work on a study of questions concerning the struggle of the working class at the present stage, analyzed new forms of labor organization and incentive in the capitalist countries, researched problems of the labor market in the developed capitalist countries, and revealed the dynamics and structure of employment and the volume and makeup of the present reserve army of labor. Results from the work of scientists at the Institute of World Economics and International Relations during 1979 have been reflected in particular, in major works such as Academician N.N. Inozemtsev's monograph "The Leninist Course of the CPSU's International Policy," and also in the collectively authored monographs (prepared jointly with researchers from the socialist countries) "West Europe in the Modern World" (in two volumes) "West European Integration and the World Economy" and others.

Last year scientists at the USSR Academy of Sciences Institute of the U.S.A. and Canada obtained new data on the methods and instruments of state monopoly regulation of the U.S. economy, including the federal contract system. Calculations were made of annual real losses of gross

output in the United States and evaluations were made of the drop in the U.S. average annual economic growth rate under the influence of the contradictions of the capitalist economic system; original indices were compiled for change in the efficiency of public production in the United States over the past 40 years. This has made it possible to formulate additional conclusions about the features of the cyclic development of the U.S. economy during the seventies and the contradictions in the capitalist utilization of the achievements of scientific and technical development, and to analyze the causes of the existing slowdown in the growth rates for production efficiency in the United States.

A number of stages has now been completed on research on the theoretical and conceptual bases of U.S. foreign policy and military-political strategy under present conditions in the European, Asian-Pacific Ocean and Near East regions, and on internal political porcesses and the internal political struggle in the United States and its state mechanism and political parties. The United States' growing dependence on imported oil is revealed; predictions have been prepared on the development of a number of directions in the foreign policy of this country. Serious works have been published, such as "The Global Strategy of the United States under Conditions of the Scientific and Technological Revolution," "American Capitalism and State Management" and others.

During the year under review the USSR Academy of Sciences Institute of the Far East has completed publication of a series of monographs on the economy of the PRC, in which for the first time in Soviet and foreign sinology a comprehensive appraisal was made of the development and status of the main sectors of the Chinese national economy since 1949. The research conducted by the Institute of the Far East showed that the Chinese leadership is uniting increasingly with world imperialist reaction and a further substantial shift to the right is noted in its politics. This is connected with the birth in the PRC of a national bourgeoisie, the attraction of foreign capital, and the aspirations of the Peking leadership for direct military and political cooperation with various capitalist countries. The institute has analyzed and evaluated the results of the 30-year period of the PRC's existence.

As a result of research done in 1979 at the USSR Academy of Sciences Institute of Africa on economic and social problems in the developing countries, criteria have been worked out for the socialist orientation of the African countries and an evaluation made of the effect of their socialist orientation on the world balance of power, taking into account the deepening of foreign policy and social-class differentiation and also the relaxation of international tension, and scientific work on the development of the Soviet Union's relations with the African countries has been generalized.

Last year scientists at the Institute of Latin America carried out research on a broad range of questions directly connected with the specific nature of the historical development of capitalism in the Latin American countries. Together with scientists from these countries, the institute's collective published the first volume of the encyclopedic reference book "Latin America," which reflects research on the natural conditions, history, economics, politics, science and culture of the Latin American region.

This year--the year of the ceremonial celebration of the 110th anniversary of V.I. Lenin's birth and the concluding year of the 10th Five-Year-Plan--it is essential primarily to finish up development of the scientific problems planned at a high scientific-theoretical level. As is known, the institutes of the department have dedicated to the 110th anniversary of V.I. Lenin's birth a number of major collective research pieces. These include: "Intensification and Proportionality an Expended Reproduction," "Scientific and Technical Progress and the Structure of Public Production," and "Agrarian Problems of Developed Socialism." Progressive work should insure completion of dummies for collective works such as "The Economic Order of Socialism" in three volumes, "The World Socialist Economy (Questions of Political Economy)" in two volumes, and others.

The profound, pro ressive changes taking place in the economic and social structure of socialist society and in the consciousness and way of life of the people are presenting new demands to investigate the law-governed patterns of social development. It is essential to substantiate more deeply the selection of directions for research and to reinforce their concentration on the most urgent problems. In this connection it is essential to think carefully about the plan for scientific research work for the 11th Five-Year Plan and to lay down good foundations for the future.

This year already it is essential to start scientific research, proceeding from the 1981-1985 Five-Year Plan whose draft has been prepared by the USSR Academy of Sciences Economics Department jointly with the USSR Gosplan, taking into account the tasks set for economic science by party and government decrees and also the sessions of the USSR Academy of Sciences General Meeting that took place in December 1979. The draft envisages that academic economic science establishments should develop research in close contact with the scientific establishments of the USSR Gosplan and the State Committee for Science and Technology, the appropriate ministries and departments, industrial associations and production management units, and with the republic academies of science. The draft for the five-year plan for scientific research work for 1981-1985 provides for intensification of research on urgent questions of the theoretical and methodological foundation of Soviet economic science. These include: characteristics and ways of constructing the material-technical base of communism; the development of production relations in a mature socialist society, taking into account the implementation in every way possible of

the principles of democratic centralism in the management of the national economy and improvement in the forms of worker participation in production management; further stimulation of the organic combination of the achievements of the present scientific and technical revolution with the advantages of socialist production relations; rationalization of the proportions for accumulation and consumption in the distribution of the country's national income and ways of increasing it on the basis of improving the efficiency of socialist management; and problems concerning the organic approximation of the city and the countryside, the elimination of the differences between mental and physical labor and the achievement of social homogeneity. Much attention is given to the following research: economic and political cooperation as the foundation of socialist cooperation, and the development of a general theory of socialist building taking into account the experience of foreign socialist countries; the strategy of socioeconomic development in individual states and entire groups of countries in Asia, Africa and Latin America in the eighties, the prospects for noncapitalist roads of development, and the experience of countries with a socialist orientation in Asia and Africa; law-governed patterns in the development of capitalism and the new forms and features of state-monopoly capitalism and its effect on the economy and on international economic and political relations; global problems of the time--energy, raw materials, food, demography, economics; and overcoming the backwardness of the developing countries and a number of other countries. An important role is assigned to theoretical analysis of problems of the class struggle, the present stage of the world revolutionary process, and insuring the unity of leftist forces, problems of the interrelationship between the struggle for peace and the struggle for social progress, and questions of a democratic alternative to state-monopoly capitalism; and to the further strengthening of criticism of bourgeois sociopolitical and economic theories and various kinds of antimarxist concepts.

Together with the enumerated urgent questions of economic science reflected in the draft plan for scientific research work in 1981-1985, resolution is also expected of a number of major theoretical problems on which scientific discussions should be organized. These include: extensive and intensive sources of growth, including methodology for calculating them; the national income and methodology for computing it; national economic criteria and problems of applying optimization principles to modeling of national economic development; methodology for prediction and its interrelationship with methods of long-term and medium-term national economic planning; and problems of insuring the coordination of the system of national economic planning and the economic mechanism for implementing plans; and others.

Experience shows that discussion of reports at meetings of the Department Bureau with the participation not only of the personnel of the appropriate institutes but also representatives of interested establishments, ministries and departments, is extremely fruitful. In this connection I would like to

mention the new, effective forms of work that have come into use in the Economics Department when preparing a number of materials. It is a question of setting up commissions from among the representatives of the various scientific establishments of Moscow and the leading republis VUZes and academic institutes. Thus, when preparing a document on scientific and technical progress, we were greatly helped by scientists from the Ukrainian SSR Academy of Sciences. Materials on top priority national economic measures have been prepared by the commissions of the Economics Department and some of them have already been approved.

In the year under review a comprehensive check was made on the activity of the USSR Academy of Sciences Institute for Africa, and accounts were heard of the scientific and scientific-organizational activity of the scientific council on the problem "Economic Effectiveness of Fixed Capital, Capital Investments, and New Equipment." These kinds of checks can do much to correct scientific directions and they offer our institutes an opportunity to discuss with the commission members a number of positive results, reveal shortcomings, and most important of all, take steps to eliminate them.

Thus, in the year before the party congress, economic scientists face important tasks whose resolution will make it possible to make a major contribution to the further development of the socialist economy. Having at our disposal a great scientific potential--which is what we economic scientists are--we are able to count on the successful fulfillment of the task- set.

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INVESTMENT, PRICES, BUDGET AND FINANCE

PRICE AWARENESS, ADJUSTMENT ADVOCATED IN CURRENT PLANNING

Moscow VOPROSY EKONOMIKI in Russian No 6, Jun 80 pp 12-21

[Article by Yu. Yakovets: "Prices, Improvement of Planning and Improvement of the Economic Mechanism"]

[Text] The development of the socialist economic mechanism--the aggregate of forms and methods employed by society for the planned application of the system of economic laws and categories--is subject to the general laws of dialectics. The escalation of the level of collectivization of labor, the increasing number and complexity of the economic relationships, and the changing requirements for implementation of the scientific-technical achievements are engendering disparities in the current system of economic management, disparities which cannot be overcome by isolated improvements in some of the elements of the system. There is an increasing need for going over to a new stage in the development of the planned management and in the complete restructuring of the mechanism for application of the economic laws relevant to the changed conditions of social reproduction. Also, the general principles of planned management are unchanged, having stood the test of time; they have been reinforced by practical experience and are now responsive to the new requirements of the management link. At the same time, management now embodies qualitatively new elements which must be organically "built in" to the existing mechanism for more effective solution of the problems which arise and for fulfillment of the party's economic strategy.

The decrees of the CPSU Central Committee and the USSR Council of Ministers (dated 12 July 1979) pertaining to improvement of the planning and the economic mechanism mark the beginning of the new stage of comprehensive restructuring of the planning administration. The profound basis of this restructuring is the need to change to a thoroughly intensive type of expanded reproduction, one which helps to resolve the conflicts between the rapidly growing requirements and the increasingly perceptible limitation of the production resources as well as helping to obtain a constant increase in the production of the final product obtained from every unit of resources used. There is great potential for accomplishment of this. What is required is a substantial increase in the effectiveness of the use of the production resources. It is important for this purpose that the indicators for the

planning and evaluation of the activity and for the motivation of the labor collectives be oriented, not to increasing the input of embodied labor, but to improving the quality of the output and achieving all possible economy of resources.

The core of the entire system of measures for improving the economic mechanism is consistent orientation of the mechanism to the final national results, to increasing production efficiency and output quality, and to a fuller satisfaction of national and personal needs. In respect to planning and economic incentive, this implies the use of indicators which on the one hand would accurately reflect the quantity and quality of the use values created in national production and in each of its links and the degree of satisfaction of society's requirements for diversified and quality products and, on the other hand, would show what costs society would incur for the production of these products and the improvement of their quality. It would thus serve as a reliable measure of the value of the goods and of the actual amount of living and national labor expended for them.

The interrelationship between the degree of satisfaction of the national requirements and the saving of time was clearly formulated by K. Marx: "The less time society requires for the production of wheat, cattle, etc., the more time it gains for other production, physical or spiritual. Both for the individual and for society the comprehensiveness of its development, consumption and activity determines the saving of time. Every economy move ultimately boils down to a saving of time. Society must expeditiously distribute its time with the precise aim of achieving production which meets its aggregate requirements." (K. Marx and F. Engels, "Works," Vol 46, Part 1, p 117). This interrelationship is of great importance for the increasingly fuller satisfaction of the constantly growing physical and spiritual needs of the people on the basis of reduction of input of national labor per unit of use value (with due consideration for quality). Growth of production efficiency, maximum economy of resources, and stepped up productivity of national labor are the chief requirements for achieving the highest aims of socialist production.

Playing a dominant role in the economic mechanism under modern conditions is the criterion of effectiveness, which determines how nearly optimum are the planning and design decisions, the rating given to the results of the work, and the economic incentive for the production collectives. Stemming from this is a significant escalation of the requirements for reliability of the generalizing effectiveness yardsticks. An important role is also played by prices, which constitute the basis for the measurement of both the costs and, to a considerable extent, the result obtained.

Of course, value and price are indirect measuring instruments for labor input and in time they give way to direct gages; in addition, prices quite frequently deviate from value--to a different extent for various goods. And nevertheless, they are now the only common measuring instrument for expenditures of living and national labor. Normative labor intensiveness can

be successfully employed to convey input of living labor for production of various types of output but it is still practically impossible to use it to measure input of living and physical labor and to compare the costs of reproducing the resources used. Use of the indicator for full labor intensiveness (computed with the help of the intersectorial labor balance sheet) is limited to the unresolved problem of reduction of labor and it is not possible to determine full labor intensiveness for millions of types of specific goods and services. Hence, the effort should now be directed to improvement of the price system.

Thus, the efficacy of the measures for further improvement of the economic mechanism is largely dependent on how skillfully and effectively the law of value and the system of value categories (among which the planned price occupies a leading place) are applied in the interests of society and to what extent provision is being made for the organic unity and interrelationship of planning and price fixing. It is not coincidental that the measures for stepping up the planning work in the national economy and strengthening the role of the economic levers and incentives are accompanied by a general revision of the wholesale prices. The purpose is to have them more accurately reflect the existing level and alinement of the socially necessary labor input, function as a more reliable yardstick for the expenditures of national labor, and make a more active impact on production efficiency, the rational use of the resources, and the technical level and quality of the output produced.

What changes in the level, relationship and structure result from the new requirements of the economic mechanism and how will these changes affect the effectiveness of the systematic application of the economic laws of socialism?

The chief result of the wholesale price revision slated for the beginning of the next five-year plan will be substantial changes in the price levels and relationships and a reflection in the price system of the changes which occurred in the value proportions after the 1967 wholesale price reform but were not fully incorporated in the partial revisions of the price lists (in 1973 for the output of machine building and light industry, in 1972 and 1976 for ferrous rolled metals, in 1974 for freight transport, etc.).

There will be a further absolute and relative rise in the costs of production of the extracting as compared to the processing industry. In 1968 the wholesale prices of the extracting industry enterprises were 58 percent higher than the 1966 level (this includes 73 percent for mining) as against 5 percent for the processing industry; as a result, in comparison with the processing industry, the relative increase in the cost of production of the extracting industry products came to 50 percent. In the subsequent years, because of the worsening of the natural conditions for production and the shift of extraction of mineral and timber resources to the country's eastern and northern regions, the cost of production of natural raw material again increased sharply. The coal industry lost its profitability status (7.3

percent of the cost of the productive capital in 1970) and again became unprofitable (3.2 percent loss in 1978); the peat industry and extraction of some nonferrous metals became unprofitable; during these years the profitability of the oil extracting industry dropped from 27.8 percent to 11 percent, the gas industry from 64.5 to 17.8 percent, and the timber industry from 16.4 to 1.2 percent. There consequently became necessary substantially higher wholesale prices for oil, gas, coal, ferrous and nonferrous metal ores, and mining, chemical and nonmetalic raw material, which will result in a rise in the costs of production of the products derived from these production sources. Thereby the wholesale prices (and consequently also the planning and estimate calculations) will more fully reflect society's increasing expenditures for raw material and the savings obtained as a result of the reduction of output materials consumption and the reduced expenditure of fuel and energy.

At the same time, we will see a further relative (and in a number of cases absolute) reduction in the prices for machine-building and chemical industry output. From 1967 to 1978 the wholesale price index showed a 22 percent decrease for the machine-building and metal-working enterprises and a 6 percent decrease for those of the chemical and petrochemical industry. At the beginning of the 11th Five-Year Plan there will be a reduction in the wholesale prices for some types of instruments and machines and also for some chemical products. The result will be more favorable conditions for the introduction of new technology and replacement of natural raw material with synthetic. However, it should be borne in mind that in accomplishing the replacement of the inventory of machines and equipment we are a long way from accomplishing the task delineated in the decisions of the 25th CPSU Congress--to implement a reduction in the level of prices for new equipment per unit of useful effect. Incorporating in the plan assignments pertaining to increased effectiveness in the realm of scientific-technical progress will enable us to make better use of K. Marx's rule concerning relative reduction in prices for machines.

Bringing the prices of specific products into harmony with the socially necessary labor costs for their production and sale and elimination of the unwarranted discrepancies in the profitability of the products will make it possible to arrive at a more correct determination of the optimum proportions for the long term and to eliminate the conflicts now seen in a number of cases between the planned assignments and the economic incentives resulting from the unwarranted diversity in the advantages of the output produced. This will permit coordination of the elements of the economic mechanism and will provide scope for more effective application of both the law of planned and proportionate development and the law of value; it will also make for strengthening of the interrelationship between plan and prices, with the dominant role assigned to the plan.

The plan is the basic instrument for the application of all the economic laws operating in the socialist society. The indicators of the plan are the instrumentalities for realizing the degree of cognition and achieving the result of the comprehensive application of the entire system of economic

laws and categories, including the law of value and including price. Prices help in determining the rates and proportions of the production and distribution of national product and national income and the rates of growth of the productivity of national labor. Prices play an important role in determining the volume of production and sale of goods and paid services, the rates of increase of real population income, the dynamics of production cost, profits and profitability, the effectiveness of new technology, capital investments, the distribution of production, foreign economic relations, and many other indicators of the plan. Without prices we could not compare costs and results or measure production efficiency not only in terms of the entire national economy but also within the enterprise or association. But price can successfully fulfill its role in planning precisely because it has its own content--it functions as a measure of the input of national labor and no other categories can take on this function under the conditions of socialism.

At the same time, it must be borne in mind that price fixing in a socialist society is inseparably linked with the plan. In the revisions of the price lists, the determination of the prices for new products, and the compilation of the planning price indexes use is made of the planning data concerning the level and structure of production cost, the capital-output ratio, profit, production volumes, etc. A change in the levels and relationships of prices and in the price pattern is an integral part of the measures for improvement of the planning and economic incentive program and of the entire mechanism of planned management.

Stepping up the role of prices as one of the effective instruments of planned management of the economic processes implies the selection of those planned (and estimate) value indicators which will provide maximum guidance for all the production links and the administrations in curtailing labor input per unit of useful effect and for minimizing the prices for the final product.

The growth of production efficiency is ultimately manifested in a reduction of the total input of living and embodied labor per unit of use value. All the other indicators of effectiveness--reduction of labor and production material intensiveness, increased yield on capital, etc.--are individual in relation to this overall generalizing effectiveness indicator, which is the instrument for the manifestation and application of the law of economy of time. The use of volume of gross (or commodity or sold) output (and in construction, volume of construction and installation work) as a leading value indicator oriented the production collectives, not for a maximum of effect, but for a maximum of expenditures. The best situation accrued to the enterprises and associations which produced the most expensive and the most materials-intensive output. They also gained the most profit per ruble of wages since profit was included in the prices for specific products in proportion to their production cost. The collectives which achieved a substantial reduction of production materials intensiveness and coverted to a more inexpensive output were punished economically: their basic indicators

declined because in the computation of gross (commodity) production new products were assessed on the basis of the first regular price and this was lower than the price of the more expensive items,which were taken out of production. This situation retarded the growth of efficiency and prevented reduction of prices for output.

We plan to make changes in the wholesale price model, which reflects the specific character of the effect and systematic application of the law of value at various stages of the development of the national economy and the planned management of the economic system. It may be that the wholesale price should more fully reflect the socially necessary expenditures for reproduction of the resources used and the actual amount of the product's surplus value. Only thus will it serve as a reliable instrument for measuring production efficiency and the planning and estimate calculations. At present the cost accounting evaluation of the labor and natural resources is clearly too low and the expenditures for their reproduction are not fully reflected in the production cost and the prices, a circumstance which, in turn, reduces the effectiveness of the measures designated for conservation of these scarce resources.

The wholesale price model put into effect in the course of the 1967 wholesale price revision, the model which assigned the industry sector norms in percentages of the value of the production capital and the profitability of the products in percentages of their production cost, led to a redistribution of the net income in favor of the capital-intensive and materials-intensive output. The expectation that this will further the growth of the yield on capital has not materialized. At the same time, there was an intensification of the gap between prices and value and there was inadequate incentive for economizing on labor and natural resources.

In the 15 years following the revision of wholesale prices the economic situation changed in many respects. Increasingly urgent emphasis was placed on the task of conservation of the primary resources (labor and n natural) and, more precisely, on a balanced program of conservation of all resources.

In the next five-year plan, when the wholesale prices are revised, the production cost will more fully reflect the expenditures for geological prospecting work, timber and water management, and recultivation of lands disturbed by mining operations; substantial increases are being effected in the deductions made by the mining enterprises for geological prospecting work and in the rates of payment of fines; there was introduced payment for the water taken by the industrial enterprises from the water system. The enterprises are increasing the withholdings for social insurance and this will make possible a fuller reflection of the expenditures for replenishment of manpower and some expansion of the economic boundaries for the use of new technology which promotes economy of living labor. At present, if we introduce a new machine which saves living labor, its cost is compared with the saving in wages and in deductions for social insurance; this does

not reflect the full outlays for replenishment of manpower. The result is a decline in the effectiveness of the labor-saving equipment. With the 1978 expenditures of 8.66 billion rubles for measures involving new equipment in industry, there was a relative effect entailing the freeing of 558,000 persons; the costs for the conventional freeing of one worker amounted to 15,500 rubles with an average yearly wage per worker of industry of 2,100 rubles and 2,900 rubles with the addition of payments and bonuses from the national consumption funds.

The industry sector norms of profitability are, as before, established in percentages of the value of the production capital and they are differentiated for the industries; the normative profit includes additionally the assets for the formation of a single fund for the development of science and technology and, in part, for financing the remodeling of the enterprises. The overall level of profitability for industry as a whole is somewhat lower than it was in the 1967 wholesale price revisions; this was due both to the growth of the capital-output rationfor industrial output and to the fact that expenditures for replenishment of national and labor resources would, beginning now, be covered mainly from the production cost.

If we generalize on a theoretical basis the direction of improvement of the wholesale price model, then in light of the above-mentioned change in the principle underlying the derivation of the norm of profitability of the products and the principle of fuller reflection in the production cost and price of the expenditures for reproduction of natural and labor resources and for scientific-technical progress, it can be said that the overall trend is for further harmonizing of prices with the amount of the output cost; the production cost will begin to more fully reflect the expenditures for past and necessary labor and, in terms of the prices for specific products, net income will more fully reflect the amount of the value created by additional labor.

An important way of increasing the effectiveness of the application of the law of value and value categories is development of long-range planning of prices in organic coordination with the value indicators of the five-year plan. This is an essential precondition for accomplishing the tasks delineated in the 12 July 1979 CPSU Central Committee and USSR Council of Ministers decree on strengthening the role of the five-year plan as the chief form of planning of the country's economic and social development and the basis for the organization of economic activity and the compilation of the financial balance sheet and the balance sheet of personal monetary income and expenditures. Accomplishing this requires that the value indicators of the plan be defined in keeping with the planned price changes.

At present the dynamics of prices and the changes in their levels, relationships and structures function only to a slight extent as subjects for long-range planning. The value indicators of the long-range and five-year plans are computed in comparative (unchanging) prices. For example, the plan for the 11th Five-Year Plan and for the long term extending to 1990 is compiled

in the prices in effect at the end of the 1970's, which prices are to a considerable degree outdated and reflect the level of socially necessary labor input of the mid-1960's or the beginning 1970's (when revisions of the price lists took place). The use of outmoded prices retards the optimization of the proportions and rates of development of the various industries and types of output and evaluation of the effectiveness of new equipment and changes in the distribution of production and in its specialization. The lack of a long-range plan in respect to prices (not only wholesale but also purchase and retail prices) complicates the compilation of the five-year financial plan and balance sheet and the setting up of realistic assignments for the long-term on the basis of the amount of profit (reduction of the production cost).

Attempts have already been made to carry out long-range planning of prices in coordination with the value indicators of the five-year plan. Thus, the first five-year plan included planned indexes of the price changes--wholesale factory prices of state industry, wholesale and retail prices for consumer goods, a budget index, and a construction index. This made it possible to compile the basic value indicators of the five-year plan (growth of the volume of national income, gross and net production of industry, agriculture and construction, capital investments, and commodity turnover) in unchanging and current prices (allowing for any planned change in these prices), compilation of a five-year financial program (including the basic indicators of the budget), and the long-term balance sheet of supply and demand. The assignments pertaining to the change in production cost and prices were also included in the second five-year plan.

In accordance with the USSR Council of Ministers decree of 24 October 1968, methodological statutes were compiled for the long-range planning of wholesale prices. Also compiled and approved by Gosplan USSR and the Goskomtsen [State Committee for Prices] USSR were the planned indexes of wholesale price changes in the 1971-1975 period for more than 100 industries, subindustries and groups of industrial output. However, in the subsequent period, unfortunately, the attention given to long-range planning of prices tailed off somewhat.

It would seem desirable to significantly expand the work of long-range planning of prices and to devote an appropriate section in the five-year plan to this subject. This section could include planned assignments for the interrelated change of wholesale, purchase and retail prices (planned price indexes for the industries and subindustries, long-range average prices for the most important types of output, and the absolute amounts of the price changes), predicted foreign trade prices and prices on the kolkhoz market, the variable balance of reciprocal price reductions and increases, and the basic directions for improvement of the methodology of price fixing. The data on planned price changes serves as a starting point for the compilation of a five-year financial plan, assignments for production cost, profit and profitability, and a balance sheet of supply and demand. The result is not only increased systematicness in the use of prices

and other value categories as well as enlargement of the scope of the planning of them but also enhanced reliability of the value indicators of the five-year plan. The system of economic laws will be applied with more accurate reference to the perspective of economic development and this will facilitate the solution of the strategic economic and social problems.

Under present-day conditions, paramount importance attaches to the active utilization of prices as an efficacious instrument for accelerating the rates and stepping up the effectiveness of scientific-technical progress. A CPSU Central Committee and USSR Council of Ministers decree of 12 July 1979 mapped out a system of measures for acceleration of implementation of the scientific-technical achievements, for the development of special-purpose comprehensive scientific-technical programs, for improvement of the standardization, for expansion of the use of natural output yardsticks in planning (which yardsticks reflect the effectiveness of consumption of this output), and for stepping up the motivation for enhancing the technical level and quality of the output. Assigned an important role in this is the matter of increasing the amounts of the incentive markups on the wholesale prices for new, highly effective output and for output which has been awarded the State Badge of Quality (especially in instances where this output is based on discoveries and inventions). At the same time, we are imposing stricter penalties (reductions from the wholesale prices) for the production of obsolescent products--products which have been assigned to the second quality category as well as those which were not submitted on time for certification.

Problems which are similar to these in many respects arise in construction, where the fundamental task is completion of introduction in 1981 of the settlements between customers and contractors for enterprises fully completed and put into operation, underway projects, and sections and installations made ready for the production of output and the rendering of services; all this on the basis of the estimate cost of the commodity construction output and in the future on the basis of a transition to delivery of installations "under key." The commodity construction output will become the most important planning and assessment volume indicator. For purposes of consistent orientation of the construction organizations for the final results, great importance attaches to the compilation of price handbooks for finished construction installations, handbooks which reflect the socially necessary labor input and which give consideration to the quality of the completed installations. The point is the estimate cost of construction cannot fully carry out the functions of prices; although it is computed on the basis of the norms, the estimate cost is nonetheless extremely individualized, is attached to specific objects, and is not sufficiently stable; it has no firm connection with the quality of the completed construction installations. The prices are stronger norms for the input of national labor. Extensive use of the price handbooks in construction was prescribed by the CPSU Central Committee and USSR Council of Ministers decree of 28 May 1969 on "Improvement of the Planning and Estimate Work" and the CPSU Central Committee and USSR Council of Ministers decree of 3 December 1971 on "Procedure for

Approval of Price Lists for Construction of Buildings and Installations."* However, this work has unfortunately not received extensive development. And the special character of many of the construction projects is hardly an excuse for this: after all, industrial output is often special but it still comes under the general principles of planned price fixing.

There should have been more active introduction in construction of the price handbooks for finished construction installations on the basis of the socially necessary labor input for the construction of them and for supplying them with equipment; also necessary were relative norms for expenditures per unit of useful effect obtained by society along with the widespread application of incentive price markups and reductions, depending on the time required for the construction and the quality of the installations. It would also have been possible to make use of the rich experience gained in improving price fixing in industry, with due consideration, of course, for the specific character of construction production. The law of value, the value categories, and the principles of cost accounting in price fixing would thereby have found more widespread application in this important sector of physical production, thus intensifying the effect in the way of increased effectiveness of the capital construction.

Deserving of great attention are the questions connected with improvement of the application of the law of value and prices as a basic value category in the realm of turnover--material-technical supply, procurement, trade, public dining, and transport. It should be noted that with the development of production specialization and cooperation, with major changes in the deployment of production and the exploitation of new regions in the country's north and west, of the physical base of procurement, material-technical supply and trade, the turnover costs are increasing not only from the absolute standpoint but also relatively, accounting for an ever greater proportion of the national value of many of the types of output at the place of consumption.** There are excessively great losses of agricultural products, fuel and materials in the process of their transport, storage and sale. It is necessary to intensify the attention to the planning and economic incentive for reduction of the cost of transportation, the costs of turnover in trade and material and technical supply, and for cutting down of losses in the realm of turnover. It is important to do an in-depth job of working out theoretical price-fixing principles and methods which take into account the characteristics of the action of the law of value in this

*See "Decisions of the Party and Government on Economic Questions," Vol 7. Politizdat, 1970, p 451; Vol 8, Politizdat, 1972, pp 619-620.

**The turnover costs in trade in percentages of the total amount of retail commodity turnover, including public dining, rose from 7.76 percent in 1960 to 9.36 percent in 1978 (See "Narodnoye Khozyaystvo SSSR v 1972" STATISTICHESKIY YEZHEGODNIK. Izdatel'stvo Statistika, 1973, p 598; "Narodnoye Khozyaystvo SSSR v 1978." STATISTICHESKY YEZHEGODNIK. Izdatel'stvo Statistika, 1979, p 443.

field because it encompasses the allocation of large reserves for stepping up the efficiency of all of national productions.

What is needed is an in-depth theoretical solution of the problem of the interrelationship between the growth of production efficiency and the dynamics of value and prices. Skillful application of the system of the economic laws of socialism is manifested in a reduction of the input of living and embodied labor per unit of output and in a reduction of its cost and prices; this, in turn, provides an impetus for further reduction of production cost and increase of production efficiency. At the same time, certain circumstances make it necessary to increase prices for raw materials and the products made from them.

Thus, the important direction for improvement of socialism's indigenous mechanism for the planned application of the economic laws is a comprehensive approach to the use of prices and the other value categories in the interests of increased production efficiency and turnover.

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INDUSTRIAL DEVELOPMENT AND PERFORMANCE

MECHANIZATION, AUTOMATION OF MATERIALS HANDLING EXAMINED

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[Article by A. Smekhov: "Mechanization and Automation of Materials Handling and Warehousing Operations"]

[Text] Full mechanization and automation of materials handling, conveying and warehousing operations (PRTSR) is an economic problem of current interest that is associated with the development of the infrastructure of the national economy. Solving it is having a substantial economic and social effect. Capital investment in mechanizing PRTSR is noted for a high degree of return: As a rule, investments are recovered within 1.5 to 3 years. Under otherwise equal conditions, savings in labor resources through mechanization of PRTSR are three- to six-fold greater than when such measures are implemented in basic industry. In the first half of the eighties, growth in labor resources was reduced by 4.1 million people compared to the period of 1971 to 1975. The labor supply will to a large extent determine the success of the economy in the next decade. An important source of replenishment of labor is the reduction of the number of ancillary workers, who make up more than 40 percent of industrial workers. For example, their number in machine building increased from 45 percent in 1965 to 49 percent in 1978. The largest share of ancillary workers perform conveying, materials handling and warehousing operations.

According to data of the USSR TsSU [Central Statistical Admin tration], the number of workers engaged in operations for transporting, loading, unloading, packaging and crating of freight is 14 million, 26 to 33 percent of the number of workers in the various sectors of the national economy.

Practice shows that labor productivity for ancillary operations and PRTSR is one-half to one-third as much as that in basic industry. More than 5 million workers are engaged in manual labor in these operations. Analysis indicates that outlays associated with performing PRTSR in the national economy are 25 to 30 billion rubles/year and make up about one-third of transportation expenses. Problems of mechanization and automation of materials handling (PRR) must also be considered from the technological aspect, inasmuch as these operations are an element of the production

process, and the efficient rhythm and smooth operation of an enterprise depends on to what extent the warehouses, shipping facilities and capacities of industrial machines are loaded.

In recent years, considerable progress has been made in full mechanization of materials handling in mainline and industrial transportation. According to 1978 statistics, the level of full mechanization of PRTSR was 91 percent in rail transportation, 93.5 in river, 95 in sea, and 81 in automotive. During the Ninth Five-Year Plan, production of hoisting and conveying equipment (PTM) increased 1.5-fold. The primary share of PTM production was concentrated in the specialized enterprises of four leading ministries: Mintyazhmash [Ministry of Heavy and Transport Machine Building], Minstroydormash [Ministry of Construction, Road and Municipal Machine Building], as well as the ministries of the electrical equipment and automotive industry. In the Ninth Five-Year Plan, the proportion of progressive types of machines increased somewhat in the PTM fleet composition: continuous conveying equipment by 1.5 percent and railless, floor equipment by 1.6 percent.

Realization of the listed measures resulted in a reduction of the number of workers by 90,000 in 1976. In addition, measures on PRTSR automation are being implemented. In this case, large-capacity automated complexes are being set up and operating successfully for transshipment of coal, iron ore, fertilizer and batched crated package freight; automatic grippers are being used for general-purpose containers, bulk freight, lumber and ferrous metals. Still, the primary problem of PRTSR--balanced development of equipment for processing and storing freight at all stages of the shipping process--has not been solved. Substantial disproportions are observed in the development of basic production of industrial enterprises and of transportation facilities, which results in abnormal idle time of transportation facilities while awaiting completion of loading operations.

Other factors are affecting the level and scale of mechanization and automation of materials handling and warehousing operations too. In rail transportation, the process of concentrating freight operations at base stations has slowed down sharply. No more than one-third of the needed capital is being allocated to outfit them with equipment. The design and parameters of rolling stock, especially cars, do not always meet the requirements for mechanized and automated loading, unloading and preservation of freight. The level of specialization of rolling stock in USSR rail transportation is about one-half to two-fifths that in the United States, and two-thirds that in the FRG. The situation is the same in automotive transportation too; there is currently a severe shortage in specialized vehicles: bunkers, tankers, dump trucks, container carriers and self-loaders. Although the composition and capacity of the PTM fleet is improving, the systems approach --intersector technological coordination--is being disregarded as a whole in its formation. The needs of the national economy for hoisting and conveying equipment are not being fully met. The level of full mechanization of materials handling of crated package freight, 10 to 12 percent, is especially low.

Analysis shows that PRTSR are equipped worse than basic production processes by a factor of three to four. Thus, in agricultural and tractor machine building enterprises, fixed capital per worker engaged in materials handling and warehousing operations is 700 to 2,000 rubles of fixed capital, while for basic production, it is four- to five-fold higher. The level of workers engaged in mechanized and automated labor in materials handling and warehousing operations in automobile, transport and agricultural machine, and machine tool manufacture is 2.6- to 2.7-fold below that in basic production. Meanwhile, capital invested in PRTSR yields a four- to five-fold higher effect than in basic industry. For example, each million of capital invested in basic production frees 90 to 120 workers, but about 500 in transport-warehousing. About 23 percent of the PTM fleet is obsolete. PTM are made in 400 enterprises; the majority of them are not specialized for PTM output. The rates of growth of container and batched shipments are inadequate. Intensive development of container shipments in the country stems from the quest to consolidate and standardize parameters of freight units.

Calculations show that shifting a million tons of freight to containers permits freeing about 1,500 loading hands and saves 3.5 to 4 million rubles. At the same time, labor productivity in materials handling increases five- to six-fold. Using general-purpose containers in rail transportation frees 50,000 to 55,000 workers in materials handling, and the economic effect on the scale of the national economy is one billion rubles per year. In 1978, the total freight shipped in containers was about 70 million tons, 20 percent more than in 1975, including more than 10 million tons shipped in specialized containers. In total freight shipped in general-purpose containers, the USSR leads the United States (42 to 38 million tons), as well as the European conutries and Japan taken together (42 to 28 million tons). There has been rapid growth of shipments in large-capacity containers, reaching 12 million tons in 1978, double that on 1975. About 20 percent of all containerized freight is now shipped in large-capacity containers.

About 1,250 container stations are operating in our country; of these, over 100 container terminals handle 20- and 30-ton containers. Plans call for setting up 350 to 400 container terminals on the railways by 1990; they will be used to ship two-thirds of all containerized freight.

Consumer goods make up the main share of shipments in general-purpose containers: paper and office supplies; and products of the electrical equipment and instrument making industry. Over 2.5 million tons of nonferrous metal ore concentrates, fertilizers and chemicals, glass, cement and other freight is shipped in specialized (grouped) containers. Freight turnover analysis shows that the USSR has substantial reserves for accelerating the rates of development of container shipments; the volume can be increased four- to five-fold.

There are deficiencies in the development of container shipments. This pertains first of all to the nonfulfillment of quotas in the five-year plan for shipment of freight in general-purpose containers. Growth in this area

in rail transportation has practically stopped, and the volume of container shipments declined in 1977 compared to 1976. Only 65 to 70 percent of freight agent orders were satisfied. The same situation was noted in 1978. Therefore, more thorough economic justification of the container pool structure is required. In using 20-ton containers, grouping of freight must be considered and the batched method of shipping in containers developed extensively. But for all practical purposes, there is currently a lack of specialized small electric loaders for loading the large-capacity containers with packets. The advantages of using large-capacity containers through raising the productivity of container reloaders and specialized gantry cranes are being lost due to the lack of a large quantity of automatic grippers which are still not being manufactured by industry on a series basis.

Container unit trains have not been extended sufficiently in rail transportaion. This is due to the severe shortage in carrying capacity of the rail lines. In the process, the effectiveness in using the latter is sharply reduced because of the increase in time for accumulating containers for a train.

In 1978, more than 150 million tons was shipped by our rail system in transport packets; this was 8 percent more than in 1977. In 1980, this traffic will grow to 170 million tons, while as a whole throughout the country, packet traffic will be 220 million tons (triple that of 1970), 20 percent of the freight suitable for packets. Making up the largest share of batched shipments are: lumber--25 percent, building brick and refractory products--11, rolled products of ferrous metals--50, and individually packaged freight--14 percent. Batched shipments are noted for their high efficiency. When individually packaged freight is batched, the cost of loading and unloading is reduced by a factor of five to six, labor productivity goes up by the same factors, and freight shipment costs go down by a factor of 1.5. Packaged shipments make up no more than 15 percent of all crated package freight. Meanwhile, not less than 80 percent of it could be batched.

Packetization of all crated package freight can save almost 3 million workers on the scale of the national economy. Confirming this are the results of packetization and containerization implemented in the supply of equipment and materials. According to the data of the Institute of Orgsnab [Supply Organization] under the USSR Gossnab, use of these shipments has an annual economic effect of 100 million rubles and frees not less than 100,000 workers. The Soyuzmorniiproyekt [State Planning, Design and Scientific Research Institure of Marine Transportation of the Ministry of the Maritime Fleet] has developed and applied the combined technology of packaging, storing, loading, unloading, positioning and securing packets and block-packets of lumber and rolled products of ferrous metals in cars and ships. Experience shows that using the technology of packaging for shipping lumber raises the productivity of PRTSR operations by a factor of two to three; expands warehouse capacity 70 percent, and increases the static load

of a car 15 to 25 percent. Packaging of rolled products of ferrous metals effects an increase in machine operator labor productivity from 30 to 110 tons/man per shift, and cuts idle time of ships and cars in half during loading operations. Today, 40 to 45 million tons of lumber is shipped by packets which has an annual economic effect of 60 million rubles, and saves about 1 million m^3 of lumber and 5,500 tons of ferrous metals. For example, in the Minsel'khozmash [Ministry of Tractor and Agricultural Machine Building], 2.8 million tons of crated package freight was shipped in packets which resulted in an economic effect of 1 million rubles. During the period 1977 to 1978, packet shipments of manufactured products by this ministry grew from 23 to 60 percent of the total "packet potential."

The possibilities of packet shipments, especially of crated package freight, are not being fully utilized. To supply packet shipments on the "door to door" principle just for rail transportation, not less than 10 million pallets and just as many sets of securing attachments are needed. Today's interchangeable pool of pallets on the railroads does not exceed 250,000 units. Fasteners and pallets are manufactured by a primitive method; as a result, the service life of pallets does not exceed 1 to 1.5 year (because of low quality), and they cost 10 to 12 rubles a piece. In addition, industry is not meeting the need for automated packet forming and unpacking machines, especially for freight in cartons and boxes. The production cost of manual packaging is 20 to 25 kopecks/ton, but it is two-fifths that when machines are used. A packet forming or unpacking machine replaces the labor of 10 to 15 loading hands. Using progressive means for packaging individually crated freight could, on the scale of the national economy, free not less than 150,000 to 200,000 loading hands and have an economic effect of 350 to 400 million rubles.

In recent years, some progress has been made in the development of PTM building and the base of equipment for mechanization and automation of materials handling and warehousing operations. PTM production has developed rapidly. In the Ninth Five-Year Plan, output of pushing containers with automatic addressing increased 1.8-fold, freight carriers--3.6-fold and overhead crane-stackers--1.9-fold. Along with an increase in PTM output and an improvement in their fleet structure, the quality and reliability of some types of machines have been raised noticeably. Thus, the reliability of forklifts, electric loaders and electric dollies increased 1.5- to 2-fold; the running time of electric loaders increased from 35-40 to 70 hours, and that of electric dollies from 80-90 to 140 hours. Consequently, expensed for repair have declined and machine productivity has been raised. PTM such as forklifts with a 3- to 5-ton lift capacity, gantry cranes, and suspended pushing conveyors meet world standards. A number of type sizes of cranes, loaders, and overhead and rack cranes of stackers, correlated with parameters of transportation facilities, has been defined. As a result of the increase in the technical level, PTM weight and power consumption are declining, series production of automated and rack stackers with a 0.5- to 12.5-ton lift capacity is being organized, and production of overhead cranes, tractor loaders and forklifts with automatic control is getting

organized on a series basis. Systems for radio control of crane installations are being manufactured on a series basis. Use of these systems is raising the speed of electric loaders and rack stackers 20 to 30 percent, which permits a 15 to 20 percent increase in their productivity. Rack and overhead crane stackers lifting 0.25 to 5 tons are being manufactured together with the racks, thus ensuring a systems approach in construction and outfitting of automated tall warehouses.

A new sector of machine building is evolving, that of robot building. Industrial robots and manipulators are working their way into materials handling and warehousing operations: packaging, stacking, conveying, etc. The VNIIPTmash [All-Union Scientific Research, Planning and Design Institute of Hoisting and Conveying Machinery, Materials Handling and Warehouse Equipment and Containers] has designed the "MAK" manipulator, lifting 50 kg, for packaging individually crated freight. The automatic "Sprut" system has been designed to convey items weighing up to 250 kg between shops. In the process, the productivity of manipulators in packaging reaches 25 to 30 tons/hour, which is equivalent to replacing 10 to 12 loading hands.

PTM with linear motors, conveyors and pallets operating on an air cushion and other designs of materials handling machines and installations have been developed and applied. When linear motors are used to drive conveyors, a uniform power load is applied to the bels, wear is reduced, and service life is extended. Under development to haul bulk freight is a pneumatic container carrier with a 0.6 to 2 m diameter pipe and productivity up to 10-11 million tons/year. According to data of the "Transprogress" firm, using 100 pneumatic container conveying systems with a productivity of 50-60 million tons/year may save about 250 million rubles in reduced expenses.

However, despite the progress made, PTM building does not meet the needs of the national economy for equipment to mechanize and automate PRR and warehousing operations. Not more than 65 to 70 percent of them are being met, 40 percent in rail transportation, and 30 to 35 percent for machines in severely short supply like electric loaders, rack stackers and gantry cranes.

In output of hoisting and conveying machinery and rates of growth, the Soviet Union is lagging behind the developed capitalist countries. For example, the annual PTM output in the United States is estimated at 3.9 billion dollars (2.3 billion rubles in the USSR in 1977). Even in the recession, the annual growth of PTM in the FRG and England averaged 17 and 27 percent respectively. Meanwhile, this indicator is 10 percent in the USSR. PTM output in these countries is 10 percent of their total machine building production, but it does not exceed 2 percent in our country.

Due to the unsatisfactory supply of spare parts and interchangeable sets of storage batteries, 75 to 80 percent of electric loaders operate on one shift; 20 to 25 percent are idle awaiting repair; and only 5 percent of the

machines operate on two or more shifts. With a regular supply of spare parts, the demand for electric floor conveyors could be reduced by about 25,000 units.

Utilization of PTM could be improved by organization of maintenance and a sentralized system of repair for the machines, as is done by many foreign firms. For example, in the United States, thanks to the organization of a rational system for maintenance and repair of electric loaders, their operational readiness factor is 0.96 to 0.97, but it is 0.75 to 0.80 in the USSR. Many of our models of PTM, in particular electric floor conveyors and rack stackers, lag behind the best foreign models in technical level, speed, weight and power consumption. Obsolete PTM are being replaced slowly. To eliminate this lag in PTM, a specialized sector for PTM building should be set up, and production of the means for mechanization and automation of PRTSR should be concentrated in specialized enterprises.

The development and introduction of progressive industrial systems for mechanization and automation of PRTSR are needed not only to realize the economic effect during their operation, but also to build a rational structure of the PTM pool. Introduction in rail transportation of standard industrial systems for mechanized processing of containers and individually crated, bulk, lumber and heavy freight is achieving a 15 to 16 percent increase in freight operation productivity. During the period 1970-1978, rail freight processing increased 11.5 percent, but the number of workers engaged in materials handling declined 10 percent. In sea transportation, 900 standard freight processing systems were introduced; they cover 165 items, are based on economic and technical calculations, and encompass 95 percent of the total freight processing volume. Implementation of these systems has resulted in an economic effect of over 3 million rubles. About 40 industrial systems for processing and transporting individually crated freight and containers are being introduced in automotive transportation.

A high-capacity mechanized and automated freight processing complex with productivity of 4000 tons/hour was built at the port of Wrangel'. It is designed to load more than 7 million tons of coal per year into specialized bulk cargo ships holding up to 100,000 tons. All processes have been automated, including dumping, delivering empty cars to the car dumper platform, classifying cars, loading ships, piling and sampling coal. Unloading complexes have been introduced at the Magnitogorsk, Cherepovets, Karaganda, Zhdanov, Novolipetsk and other metallurgical plants. They include car dumpers, conveyor lines and mechanized storage and can unload up to 2000 tons/hour.

For operations in coal mines and open pits, automated loading complexes have been put into service; in an hour, they can load up to 4,000 tons into rail cars and also store up to 300,000 t of coal in special mechanized storage areas at the same time.

Fundamental changes have been made to the design and technology of warehouses for crated package freight. Current warehouse projects

provide for a capacity of up to 150,000-160,000 package cells and a height up to 50 m (up to 100 m in the future). An intensive program is underway to build rack-type warehouses in industrial and trade enterprises and in the sphere of supply of materials and equipment.

Also being introduced in our country are standard industrial projects of tall warehouses for packaging crated package freight ranging from 8.4 to 22.8 m. It should be noted that in changing the height of the racks from 8.4 to 16.2 m, capital outlays are reduced 15 percent.

A high storage capacity of warehouses ensures a balanced process of production, transportation and consumption of the material resources of the national economy. Much importance is attached to developing warehouses in the USSR. In industry, for example, fixed capital of warehousing services is 35 to 40 billion rubles, which is 10 to 15 percent of the fixed capital in the sectors of industry. Physical assets stored in warehouses are valued at up to 90 billion rubles, 13 percent of the country's gross national product. Scientific research institutes of the USSR Gossnab are now drafting a general plan for development and location of warehousing services to the year 2000. However, not all warehouse designs are meeting today's needs. This pertains to inadequate capacity, low level of outfitting with equipment and unsatisfactory conditions for storing physical assets. As a result, annual losses in warehouses just in the area of supply of materials and equipment are over 1 billion rubles.

Over 50 percent of the warehouses used in rail transportation were built before the revolution, and 150 warehouses used by the Mintyazhmash are subject to demolition. The level of mechanization in warehouses of the enterprises of this department is only 16 percent. In 1976, metal losses due to corrosion were 12 million rubles at the Kuznetsk Metallurgical Combine because goods were stored in unsuitable warehouses. Effectiveness of full mechanization and automation of PRR depends on the degree of concentration of freight operations too. According to data of the scientific institutions of the Ministry of Railways, concentration of freight operations at rail base stations leads to a 10 to 15 percent increase in labor productivity for freight operations. There are favorable economic conditions for concentrating freight operations in rail transportation. From 1962 through 1977, the number of stations was reduced 11 percent; however, there are about 1,300 stations today where the volume of PRTSR is no more than two to three cars per day. Sixty percent of the stations lack the means for mechanization of materials handling. To achieve the maximum economic effect in rail transportation, the number of base stations has to be 2,500 to 3,000.

Coordination of design and parameters of rolling stock and PTM is of major importance to full mechanization and automation of PRR. The chief way to solve this problem is through specialization of transportation facilities. In rail transportation, the level and scale of specialization of the car fleet has grown substantially through building bunker cars. Hopper cars, mineral, cement and grain carriers permit raising unloading productivity

to 2,000 tons/hour. Using specialized hopper cars to haul fertilizer yields an economic effect of not less than 100 million rubles/year. Plans call for building over 7,000 mineral carrying cars in the current five-year plan. When using container carrying, bulk cargo and lumber ships and those with horizontal unloading, the "RO-RO" [roll-on/roll-off] type, the intensity of freight operations increases 15 to 25 percent. A progressive trend in automotive transportation in specialization of vehicles is the use of self-loading vehicles for individually crated freight and containers; these vehicles can lift from 1.25 to 20 tons. Unfortunately, specialized types of vehicles are not being delivered to the national economy in the needed quantity. The fleet of rail and automotive specialized vehicles in developing slowly in industrial transportation. There is a severe shortage of cars to carry coke and cars to haul cold-rolled steel in coils, slabs, molten cast iron, etc.

Calculations by the VNIIPTmash show that it is advisable to bring the level of full mechanization of PRTSR in the national economy to 95 percent in the next 15 to 20 years. To attain this level in rail transportation, about 1.5 billion rubles of capital investment will be required. These outlays should be recovered within 2 to 2.5 years. In implementing measures on full mechanization and automation of PRTSR in the country, production of hoisting and conveying machine buidling will have to increase 2.5-fold in 1995 over that of 1976 (or 6.3 billion rubles/year). In 1995, it is planned to raise labor productivity in materials handling and warehousing operations 3.5- to 4-fold, and to free 13-14 million workers for utilization in other areas of the national economy. During the period 1981-1995, 30-33 billion rubles can be saved in operating expenses in PRR and warehousing operations.

To improve the use of resources and raise the effectiveness of full mechanization and automation of PRTSR, a number of organizational, scientific and technical problems have to be solved. One such problem is the development and implementation of a unified national economic target program to develop full mechanization and automation of PRR and warehousing services to the year 2000. To realize this program, it is advisable to provide in national economic plans for allocation of the money and resources to mechanize and automate PRR and warehousing services. Of major importance is the implementation of new principles of organization of warehousing services based on setting up high-capacity, automated freight transportation complexes, combining the functions of warehouses of industrial enterprises and bases of the state system for supply of materials and equipment. Such complexes should perform the functions of warehouses of collective use and ensure the best utilization of capacity, equipment and labor. To raise the level of mechanization and automation of warehousing processes, it is advisable to increase the percentage of hoisting and conveying equipment of the fixed capital of warehousing services.

Evaluating the measures on full mechanization and automation of PRTSR requires considerable improvement in the system of indicators of their

effectiveness. The indicator used now is the level of full mechanization, defined as the ratio of total mechanized processing of freight to total freight processing. It seems to us that full mechanization of PRTSR should be evaluated by two indicators: the level of mechanization, which describes the scale of use of the means of mechanization in materials handling and warehousing operations, and the degree of savings in labor. The latter indicator is defined as the ratio of savings in labor to the labor required to perform the freight operations manually.

This suggested system for evaluating full mechanization should encourage executives to accelerate their efforts and produce a comprehensive evaluation of the status of mechanization of PRTSR. To select the best alternative for full mechanization and automation of PRTSR, qualitative technical and economic calculations are needed. Meanwhile, in many cases, such calculations are not made. In planning for the means of mechanization and automation, different coefficients of effectiveness of capital investment are adopted. For example, in selecting means of mechanization at a fruit or vegetable warehouse, this coefficient is considered 0.10, but in retail trade it is 0.20. Such differentiation hinders proper determination of national economic effectiveness of measures on full mechanization of PRTSR in the whole area of freight shipping. In our opinion, a unified approach is needed in evaluating the effectiveness of capital investment for mechanization and automation of PRTSR. It is determined by the optimal structure of the fleet and the capacity of PTM for the long term within the framework of the national economy as a whole and for its individual sectors. The structure of the fleet by type and capacity of equipment contains the information needed to develop PTM building. The problem of defining a mutually coordinated optimal PTM fleet structure is a complex one. To obtain the practical results of its solution, it has to be broken down into simpler subtasks, solvable at the sector, ministry and department level with subsequent coordination of the results of their solution on the scale of the national economy. When the data is available on the volume of the various kinds of loading, unloading and storage processes, the production cost and productivity of performing transshipping operations, and on the technological links between groups of homogeneous freight and interchangeable PTM, the problem of forming the PTM fleet can be solved by mathematical programming methods.

Taking native and foreign experience into account, the PTM fleet structure should be improved by increasing the percentage of electric loaders, forklifts, bucket loaders, rack and overhead crane-stackers, conveyors with automatic addressing and other types of machines.

Solving the complex of optimization problems, in which economic indicators such as investments of time, energy, operating expenses, etc. are taken as criteria, is unquestionably of theoretical and practical interest. These problems include determining the optimal parameters of materials handling machines and installations; the capacity of the technical equipment of shipping facilities and warehouses; optimal control of hoisting and

conveying machines, associated with regulating acceleration, speed and pulling force during their operation; selecting a rational PTM service life; distribution of interchangeable PTM, etc. An example of a solution to this problem is defining the optimal PTM service life. Analysis done at the MIIT [Moscow Institute of Railroad Transportation Engineers] showed that after five to six years of operation of gantry cranes and tractor loaders, productivity falls 20 to 25 percent. To a certain extent, a major overhaul increases the productivity of these types of machines, but as a whole it tends to reduce the productivity of PTM. Technical and economic analysis can reveal the nature of change of the component functions of outlays as a function of service life, and then the optimal value can be defined. Calculations, made with the aid of dynamic programming, showed that the optimal operating life for gantry cranes and tractor loaders, five to seven years, is considerably less than their service life. It is advisable to put problems on automation of materials handling and warehousing operations into a separate group. They are solved by developing economical systems for automatic control of PTM that are reliable in operation. In connection with this, of interest is the elaboration of the questions of engineering psychology and its applications to the peculiarities of the functioning and interaction of the human operator and the system of automated materials handling machines. A peculiarity of the functioning of this system is the high intensiveness of performing freight operations over a prolonged period of time and the great psychological load on the operator.

To raise the level of effectiveness of full mechanization and automation of PRTSR, the following basic measures have to be implemented: development and implementation of a target long-term program with the participation of the transportation and industrial ministries and departments, the trade and agricultural organizations, and scientific institutions; establishment of a sector for hoisting and conveying machine building or a subsector in the form of an all-union production association; acceleration of the process of concentrating freight operations at stations and industrial sidings by establishing highly mechanized and automated warehouses and bases for collective use; and increased production of pallets and other packaging devices.

The problem of full mechanization and automation of materials handling and warehousing operations indicates its relevance to the whole national economy.

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